

## ***Interactive comment on “Sources and cycling of nitrogen in a New England river discerned from nitrate isotope ratios” by Veronica R. Rollinson et al.***

### **Anonymous Referee #2**

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The authors present a comprehensive study about the nitrogen sources and cycling in a well-studied river and estuary system in New England, USA. They used a complex one-year data set, including all nitrogen components such as DIN (ammonium, nitrite and nitrate), DON and PN, additional the stable isotopes ( $^{15}\text{N}$  and  $^{18}\text{O}$ ) of nitrate including  $^{17}\text{N}$  for deposition analysis. The data set contains weekly data from two station, seasonal transects in the river at 15 station, one high resolution short transect, and data from two WWTP near the mouth of the river. Additional, ammonium and nitrate concentrations and stable isotope of nitrate in atmospheric deposition were provided. The main findings are that nitrate sources mainly stemming from the groundwater and from shallower groundwater and surface flow during higher river discharge

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during the cold month. WWTP and industrial zone runoffs had a portion of approx. 20 %. The stable isotope analysis suggest the river-in nitrogen cycling is not that important in relation to the sources. One suggestion is that by nutrient spiraling occurring were reverse processes are not visible in concentrations or isotope signals. In comparisons to former studies in the river estuary system, there is an increase of nitrogen loads to the adjacent Little Narragansett Bay, which causes eutrophication.

The manuscript is well written and presented a robust data set and the interpretation and discussion based on that and is not excessive, although, the text is somehow too long and can be shorted, especially in the discussion. The study present a good contribution to the discussion about the role of rivers and estuaries nutrients transport from the land to the ocean.

Nevertheless, I have some comments and questions on some issues in the manuscript.

L 11ff: The abstract is a bit too long and should focus more on the main finding. It seems like a list of what were done and what were discussed. Be more specific.

L 84: The  $^{18}\text{O}$  values of nitrate produced by nitrification ( $\leq 1. . .$ ) is misleading, because later on you discuss it is bit different way, that is depending on the  $^{18}$ value of the water and so ‰ higher. (see L 595 ff)

L 133: Maybe, just because I'm not a native speaker and not from USA. What exactly are turf farms? Do they produce grass, which can put later in the garden or it is something to produce peat. This could explain the high concentration of tannin in the water.

Figure 1, L144: I needed a bit to understand the description and the map, please present the sampling sites and map in a clearly arranged way.

L 150 Explain shorty why you are not measure in the same period and be aware that deposition data are just represent a period of higher precipitation

L 180. Do you also measure  $^{15}\text{N}$   $\text{NH}_4$  isotopes? Could be interesting to see what

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happened to the deposited nitrogen in whole. . .

Figure 2: the figure is relatively small. I'm surprised that the summer nitrate concentration were higher in summer than in winter.

Figure 4: In "a" and "b" you present the fluxes from the WWTP. The discharge from the WWTP was much more smaller than the discharge of river itself, so that the presentation is a bit misleading, especially because later on the discussion of the source count the WWTP later on (L770 ff)

Figure 6: Explain why the station 6 is separated (Tributary)

Before L366. The depositions results are not presented in the results section, but later in the discussion.

L400: Reference for the tannins are missing. How high is the refractory and labile part of the DON

L403: The unexpected nitrate concentration in summer should be compared to other rivers like you already done with the results from Fulweiler&Nixon

L 526: What happened with the NH<sub>4</sub> in the atmospheric deposition?

L661: Use these turf farms a high amount of fertilizers?

L 685: Who or what is responsible. Agriculture? Too much fertilizers? Turf farms?

L 703: What is the main source for the increase of nitrate in the groundwater? I would expect higher use of fertilizer?

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